FIG.1

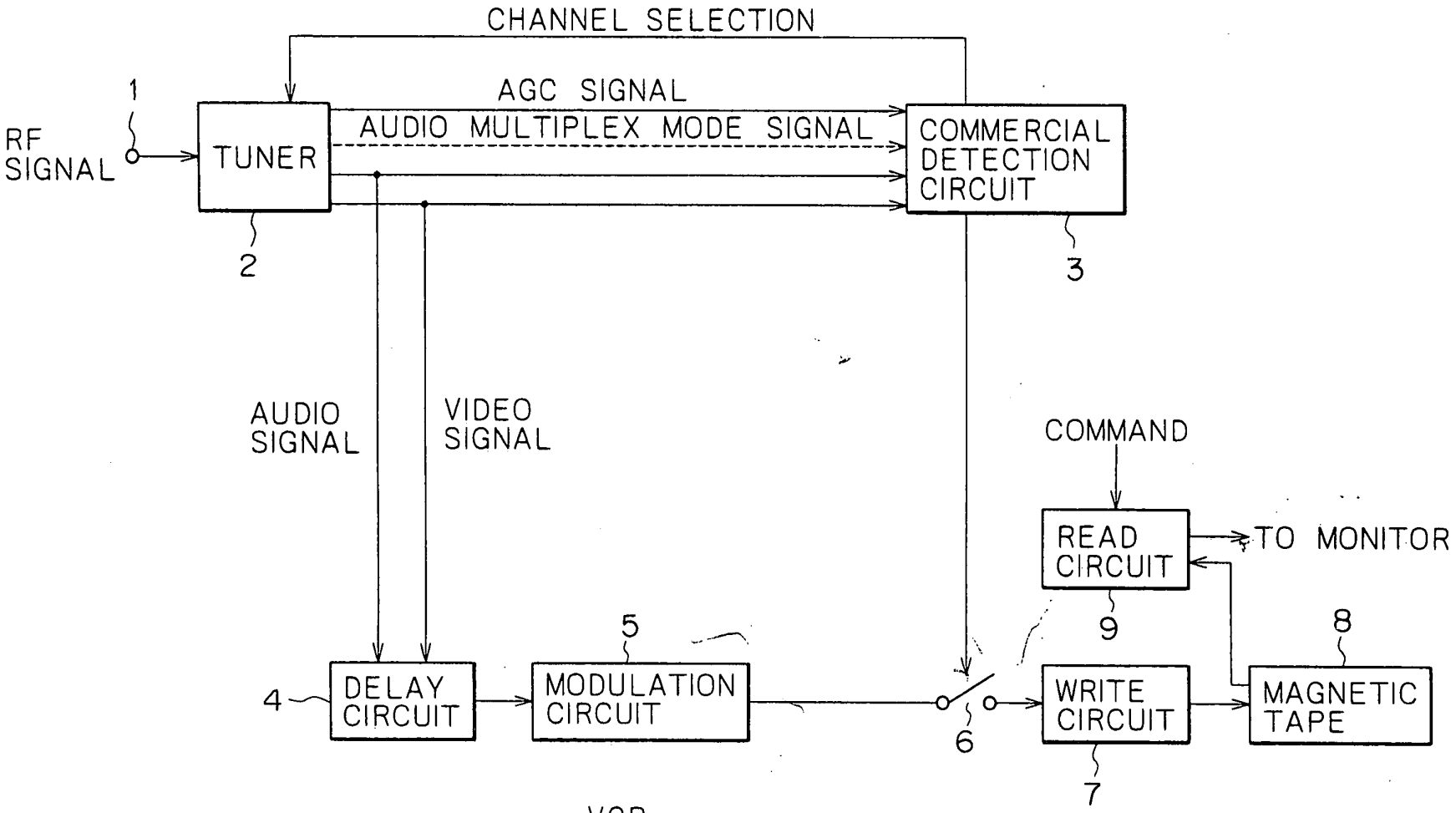

CHANNEL SELECTION
1
AGC SIGNAL
RF SIGNAL
TUNER
AUDIO MULTIPLEX MODE SIGNAL
COMMERCIAL DETECTION CIRCUIT
2
3
AUDIO SIGNAL
VIDEO SIGNAL
COMMAND
READ CIRCUIT
TO MONITOR
9
8
5
4
DELAY CIRCUIT
MODULATION CIRCUIT
6
WRITE CIRCUIT
MAGNETIC TAPE
7
VCR

FIG. 2

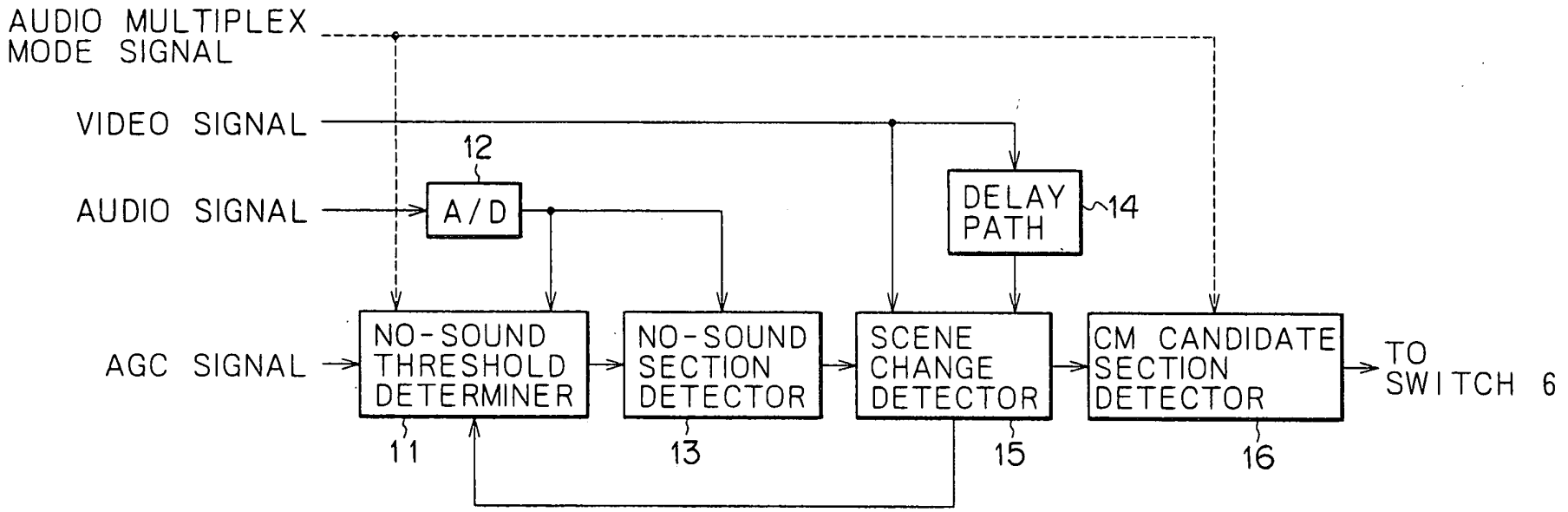

AUDIO MULTIPLEX MODE SIGNAL
VIDEO SIGNAL
AUDIO SIGNAL
AGC SIGNAL
12
A/D
DELAY PATH
14
NO-SOUND THRESHOLD DETERMINER
11
NO-SOUND SECTION DETECTOR
13
SCENE CHANGE DETECTOR
15
CM CANDIDATE SECTION DETECTOR
16
TO SWITCH 6

FIG. 3

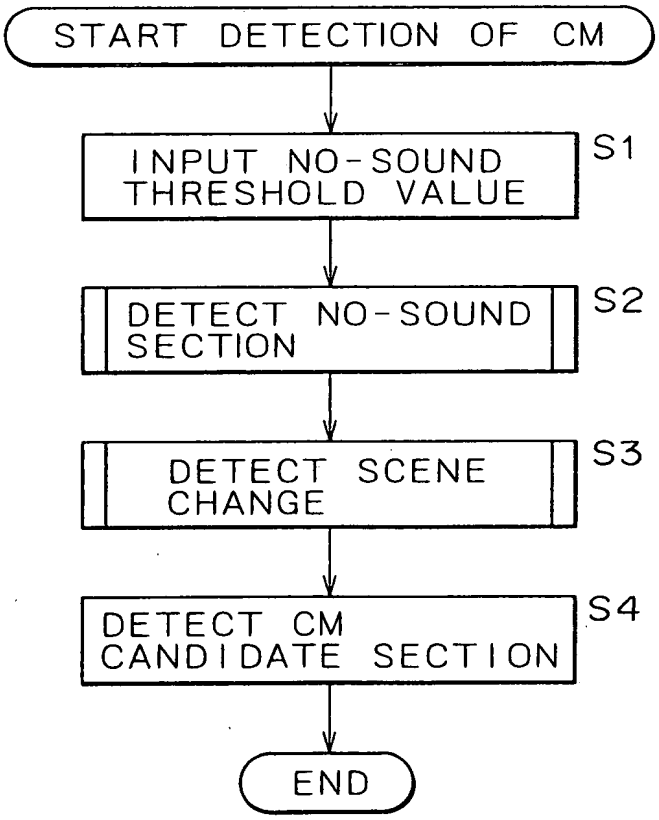
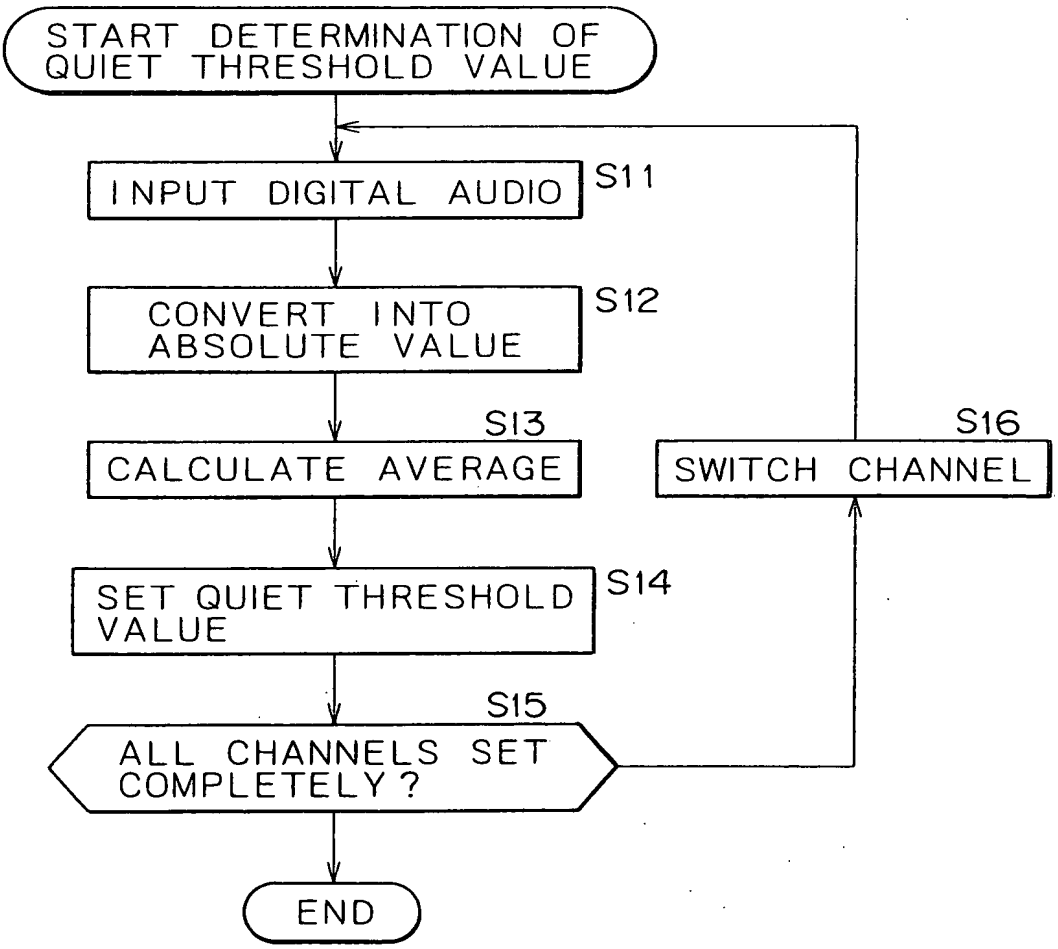

START DETECTION OF CM
INPUT NO-SOUND THRESHOLD VALUE
S1
DETECT NO-SOUND SECTION
S2
DETECT SCENE CHANGE
S3
DETECT CM CANDIDATE SECTION
S4
END

FIG. 4


START DETERMINATION OF QUIET THRESHOLD VALUE
INPUT DIGITAL AUDIO
S11
CONVERT INTO ABSOLUTE VALUE
S12
CALCULATE AVERAGE
S13
SET QUIET THRESHOLD VALUE
S14
ALL CHANNELS SET COMPLETELY?
S15
SWITCH CHANNEL
S16
END

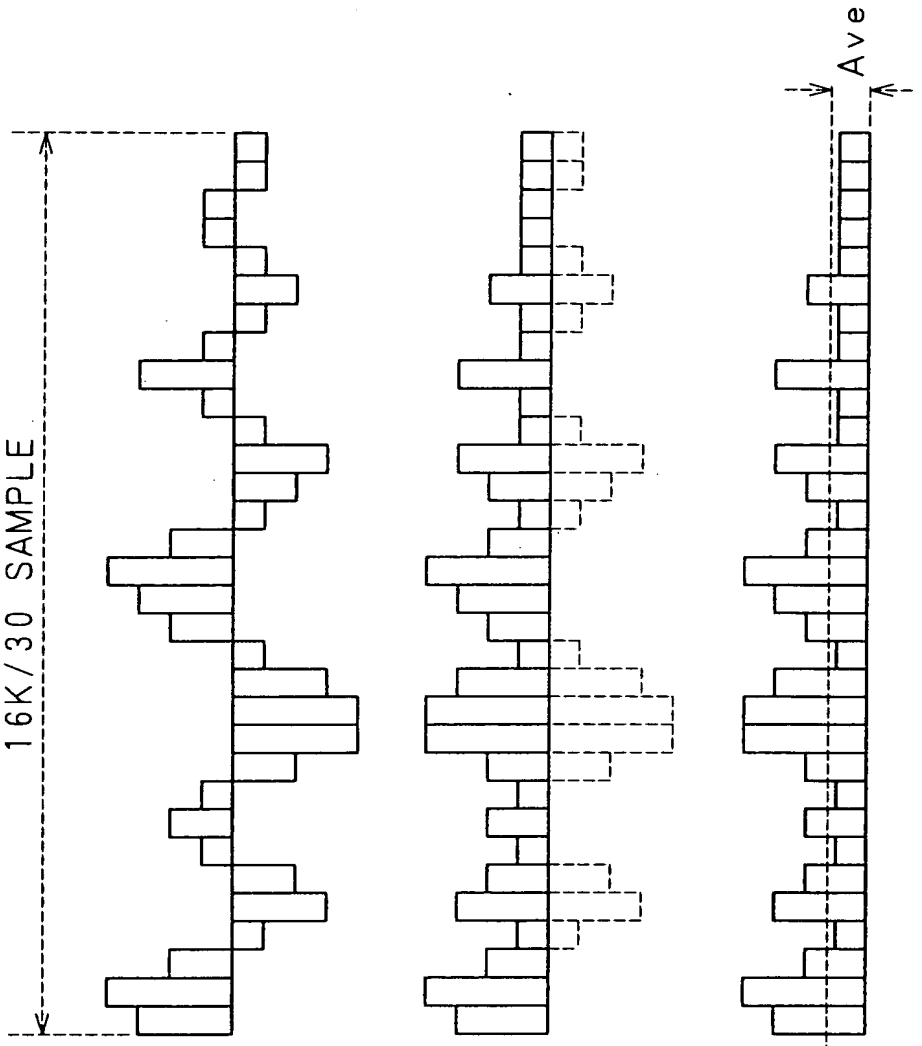


FIG. 5A

FIG. 5B

FIG. 5C

FIG. 6

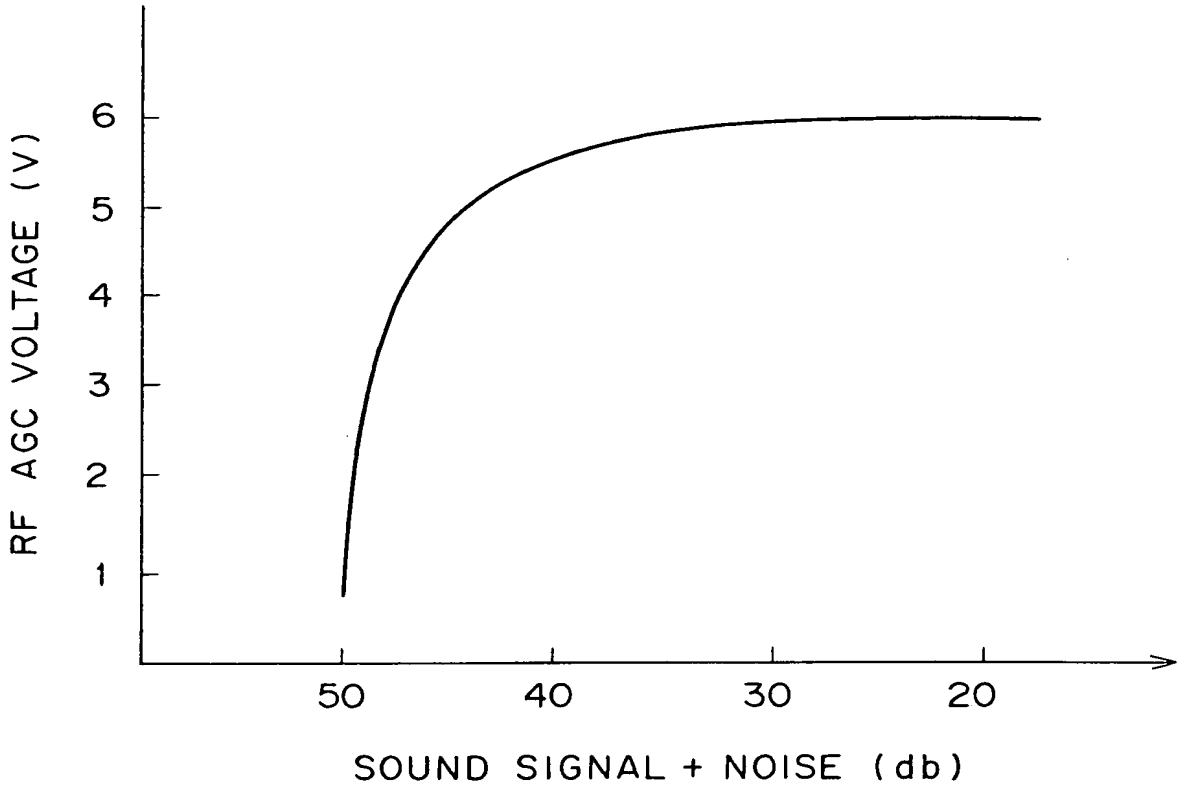
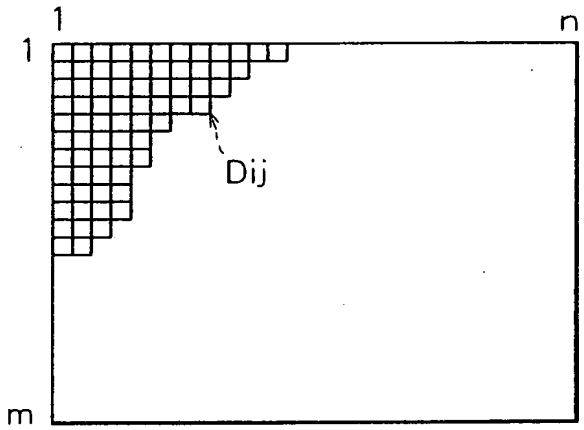


FIG. 7



$$Y_A = \frac{\sum_{i=1}^{n} \sum_{i=1}^{m} Dij}{n \times m}$$

FIG. 8

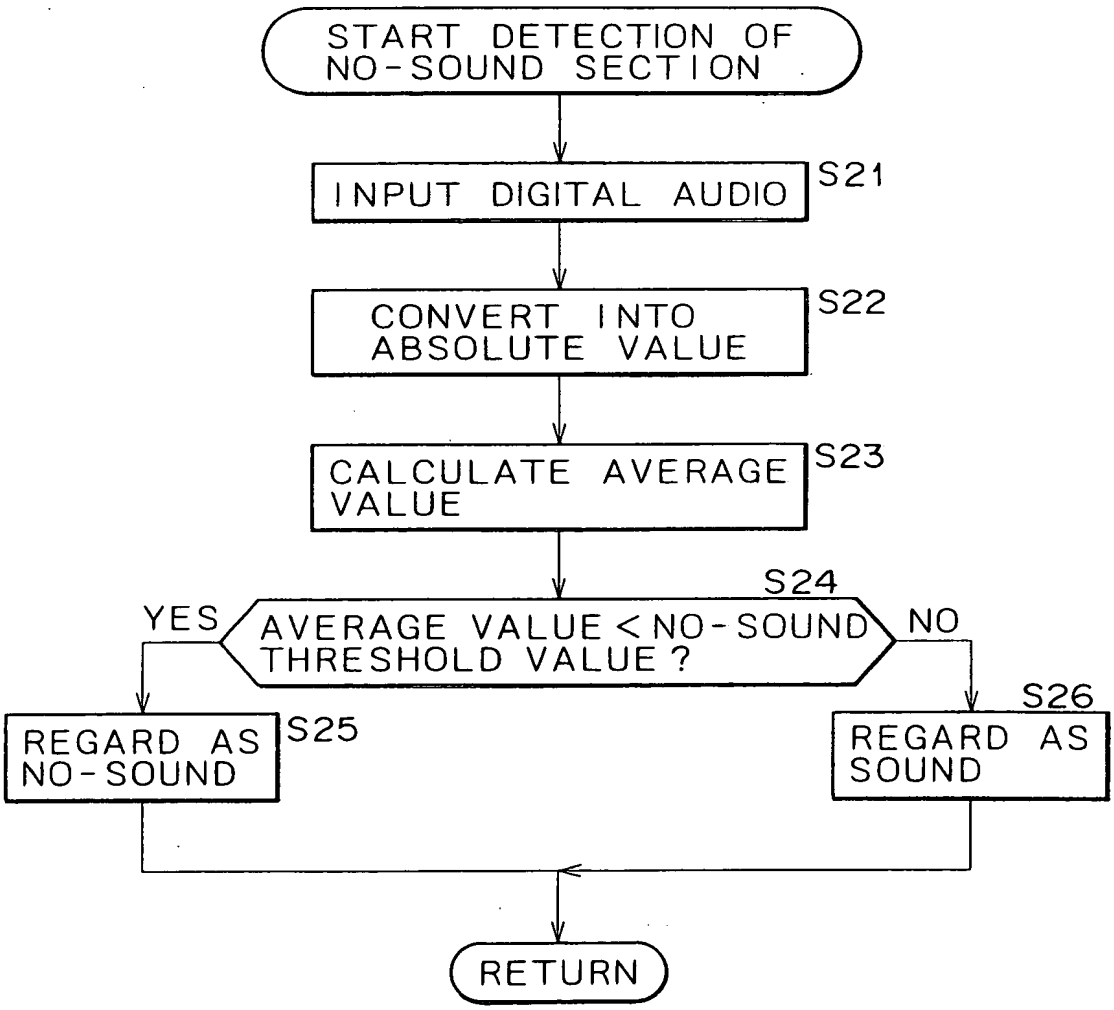

START DETECTION OF NO-SOUND SECTION
INPUT DIGITAL AUDIO
S21
CONVERT INTO ABSOLUTE VALUE
S22
CALCULATE AVERAGE VALUE
S23
S24
AVERAGE VALUE < NO-SOUND THRESHOLD VALUE ?
YES
NO
REGARD AS NO-SOUND
S25
REGARD AS SOUND
S26
RETURN

FIG. 9

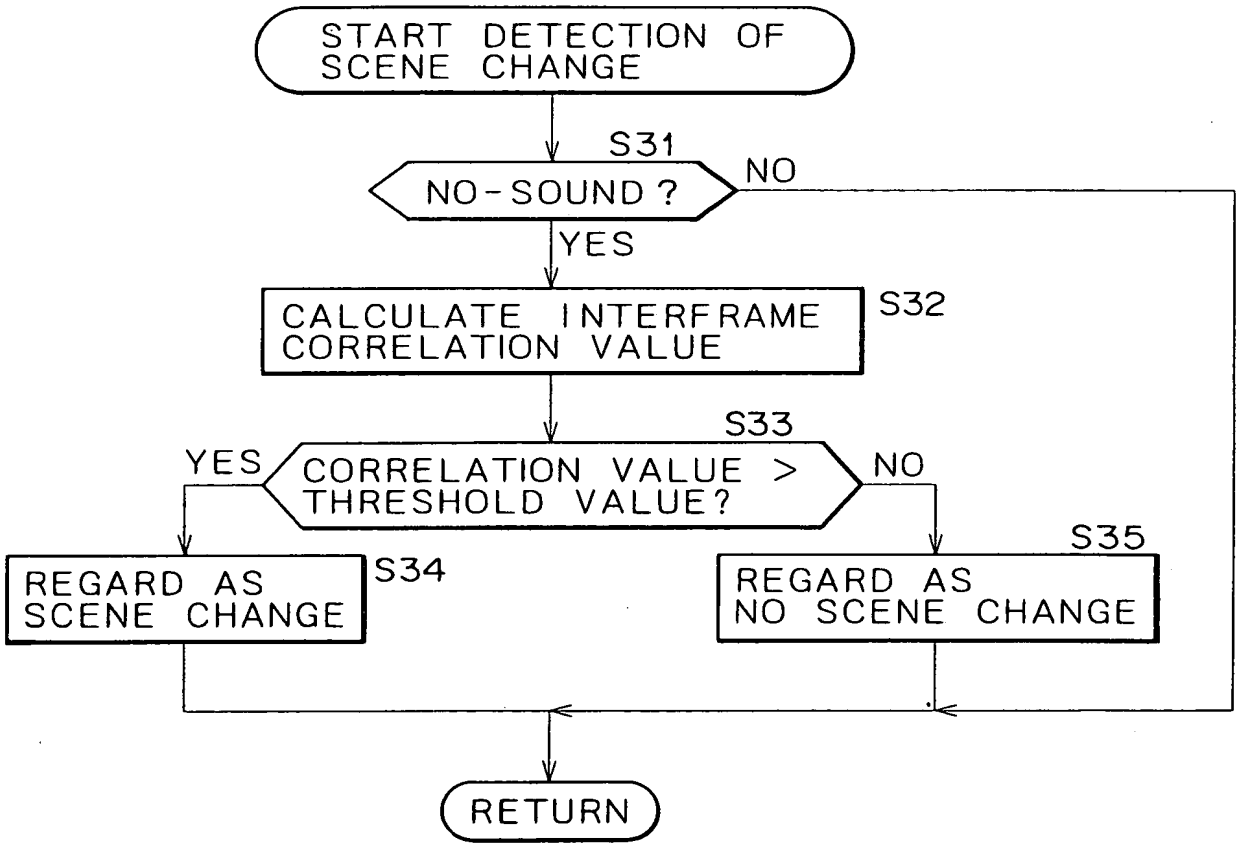
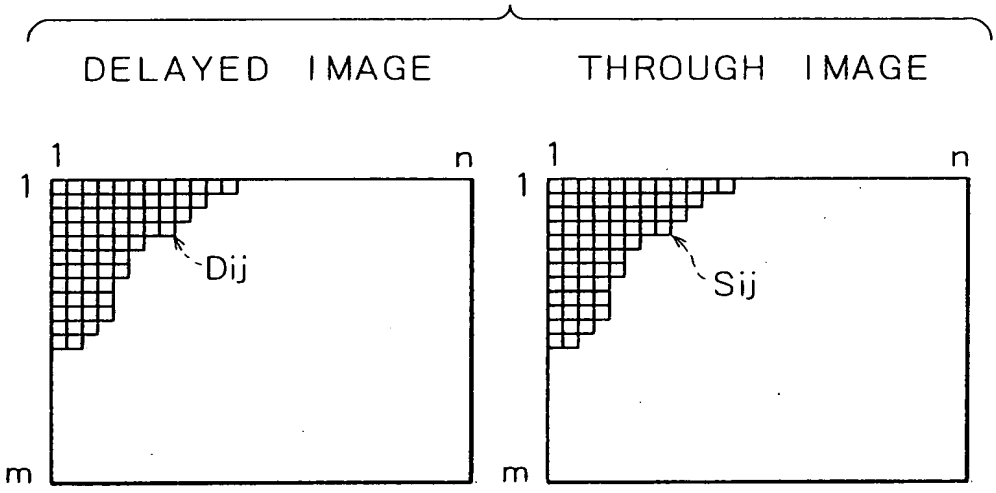

START DETECTION OF SCENE CHANGE
S31
NO-SOUND ?
NO
YES
CALCULATE INTERFRAME CORRELATION VALUE
S32
S33
YES
CORRELATION VALUE > THRESHOLD VALUE?
NO
S35
REGARD AS SCENE CHANGE
S34
REGARD AS NO SCENE CHANGE
RETURN

FIG.10



$$E = \sum_{i=1}^{n} \sum_{j=1}^{m} | Dij - Sij |$$

FIG.11

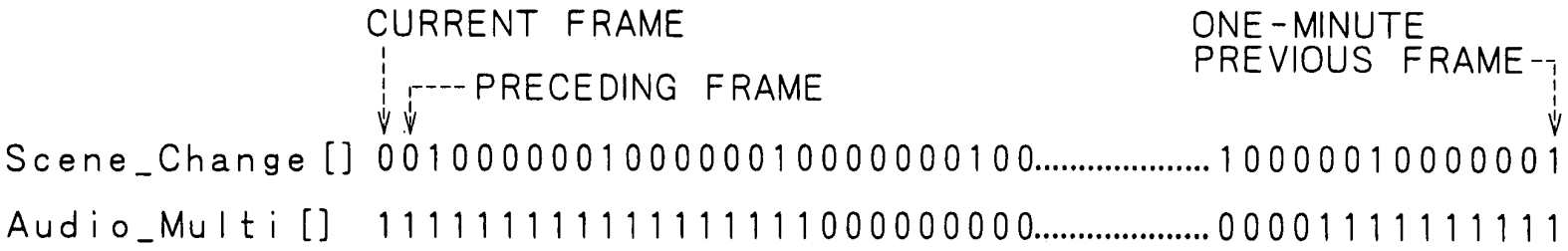

CURRENT FRAME
PRECEDING FRAME
ONE-MINUTE PREVIOUS FRAME
Scene_Change [] 00100000010000001000000100.....10000010000001
Audio_Multi [] 11111111111111111000000000.....00001111111111

FIG.12A

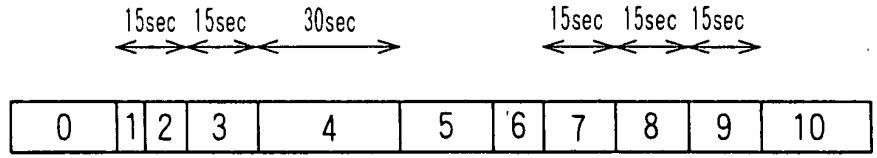


FIG.12B

FIG.12C

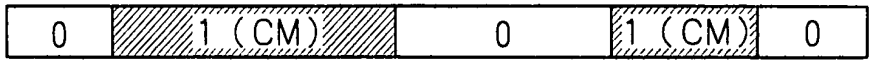


FIG.13

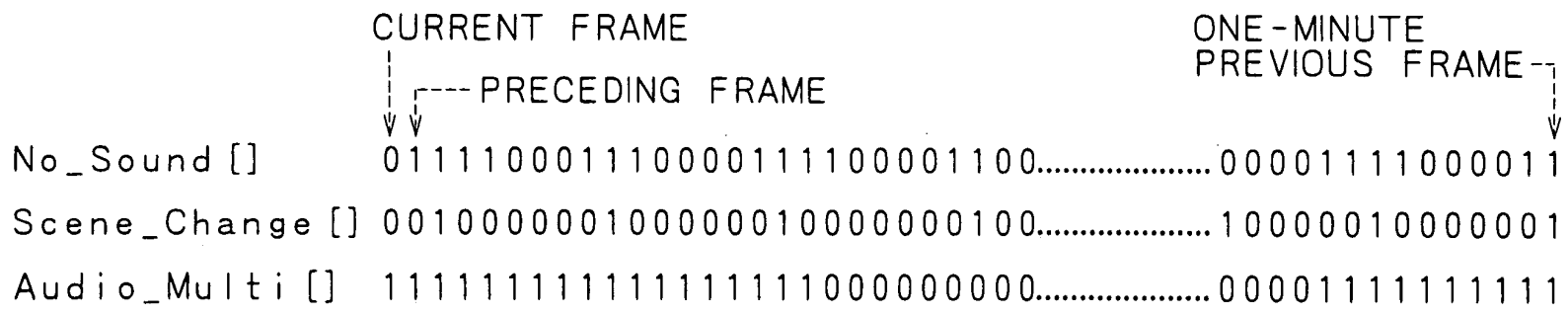

CURRENT FRAME
PRECEDING FRAME
ONE-MINUTE PREVIOUS FRAME
No_Sound []
0111100011100001111100001100.....00001111000011
Scene_Change []
0010000001000000100000000100.....10000010000001
Audio_Multi []
1111111111111111111000000000.....00001111111111

FIG.14A NO-SOUND

FIG.14B SCENE CHAGE

FIG.14C (A) AND (C)

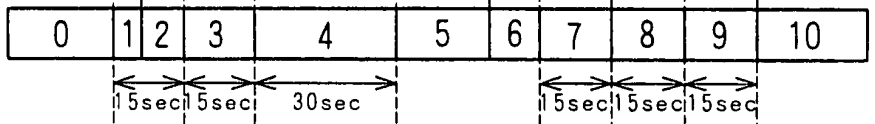


FIG.14D GROUP

FIG.14E AUDIO MODE

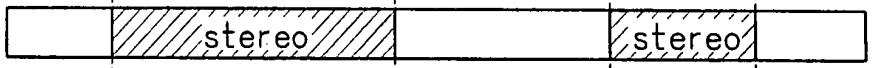


FIG.14F CM CANDIDATE SECTION

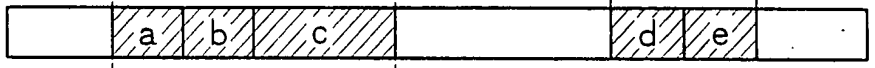


FIG.14G RESULT OF CM DECISION

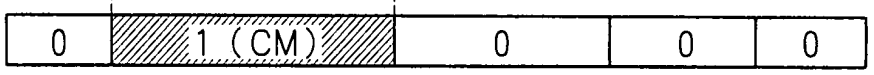


FIG.15A

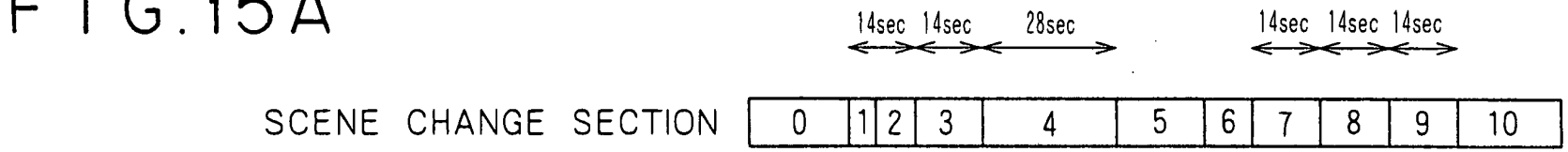


FIG.15B

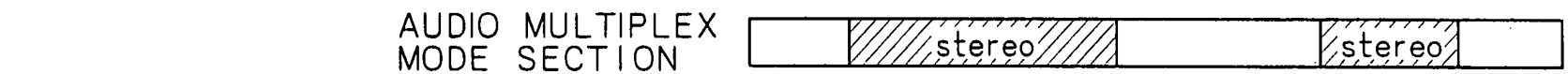


FIG.15C

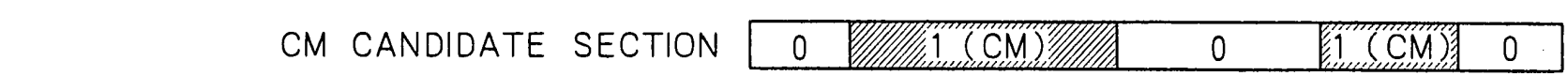
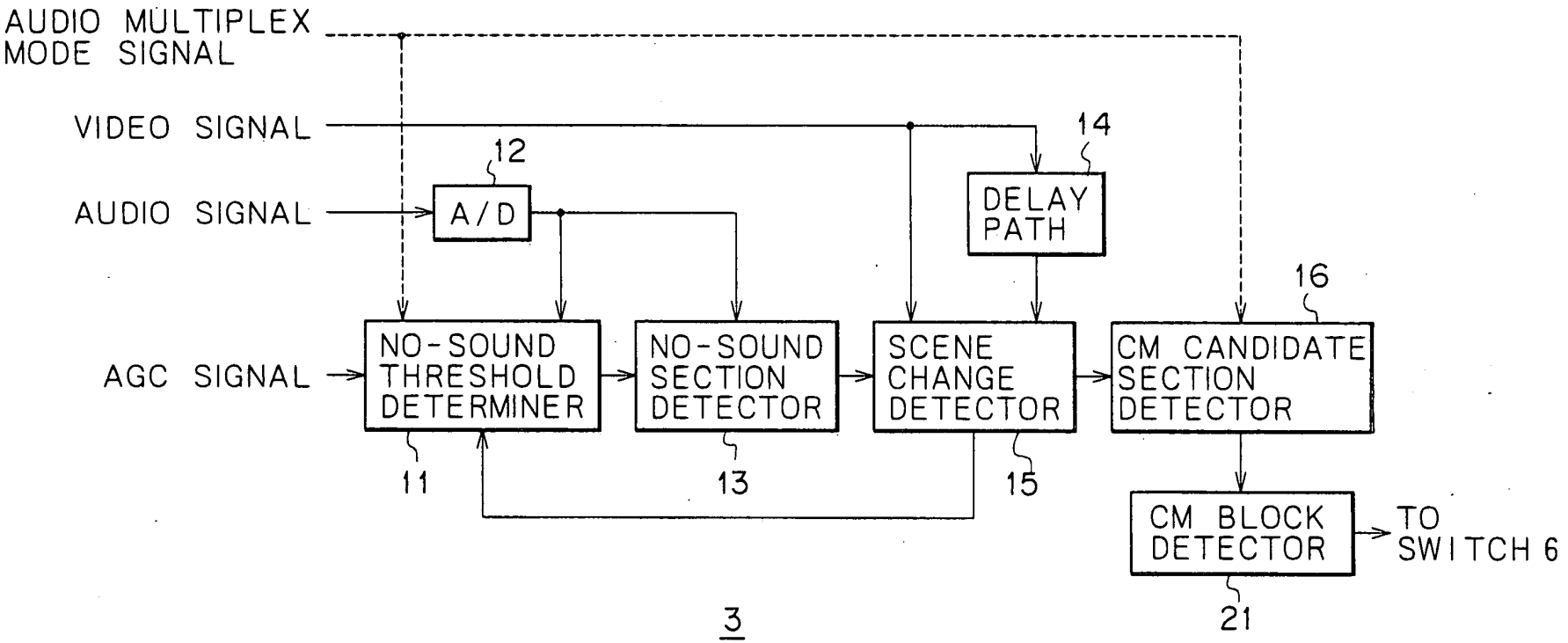


FIG.16


AUDIO MULTIPLEX MODE SIGNAL
VIDEO SIGNAL
AUDIO SIGNAL
AGC SIGNAL
12
A/D
14
DELAY PATH
16
NO-SOUND THRESHOLD DETERMINER
NO-SOUND SECTION DETECTOR
SCENE CHANGE DETECTOR
CM CANDIDATE SECTION DETECTOR
CM BLOCK DETECTOR
TO SWITCH 6
11
13
15
21
3

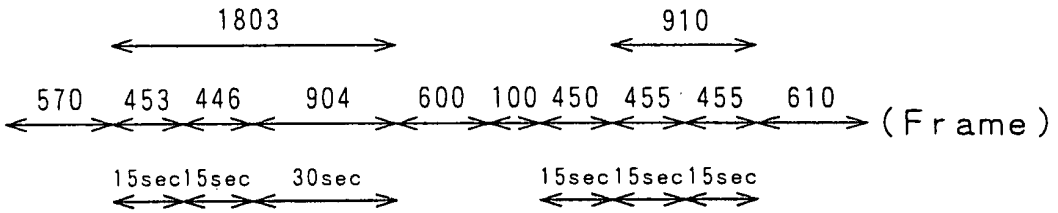


FIG.17A QUIET SCENE CHANGE SECTIONS

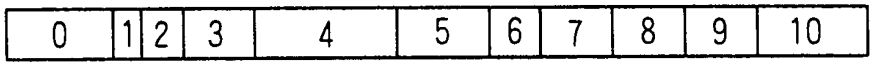


FIG.17B AUDIO MULTIPLEX MODE SECTIONS

FIG.17C COMMERCIAL CANDIDATE SECTIONS

FIG.17D COMMERCIAL CANDIDATE BLOCKS

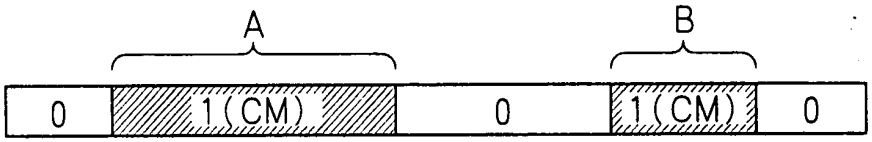


FIG.17E COMMERCIAL BLOCK

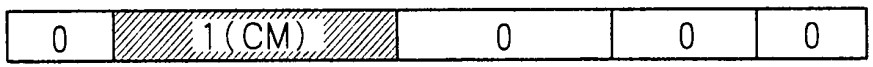


FIG.18A

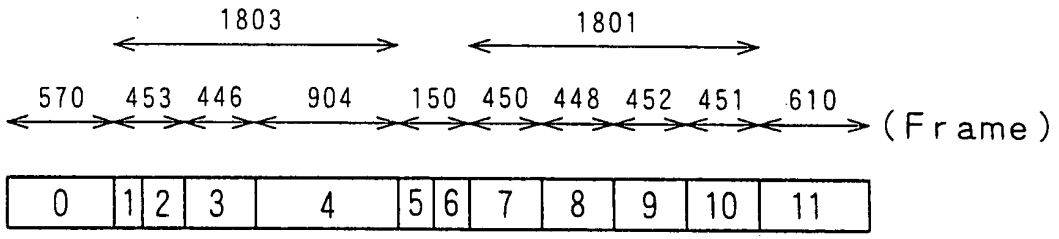


FIG.18B

FIG.18C

FIG.18D

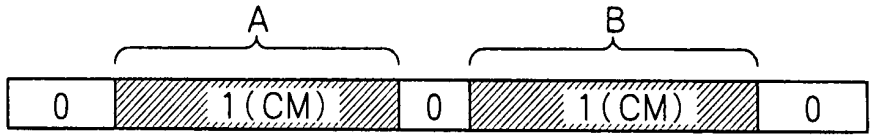


FIG.18E

FIG.19

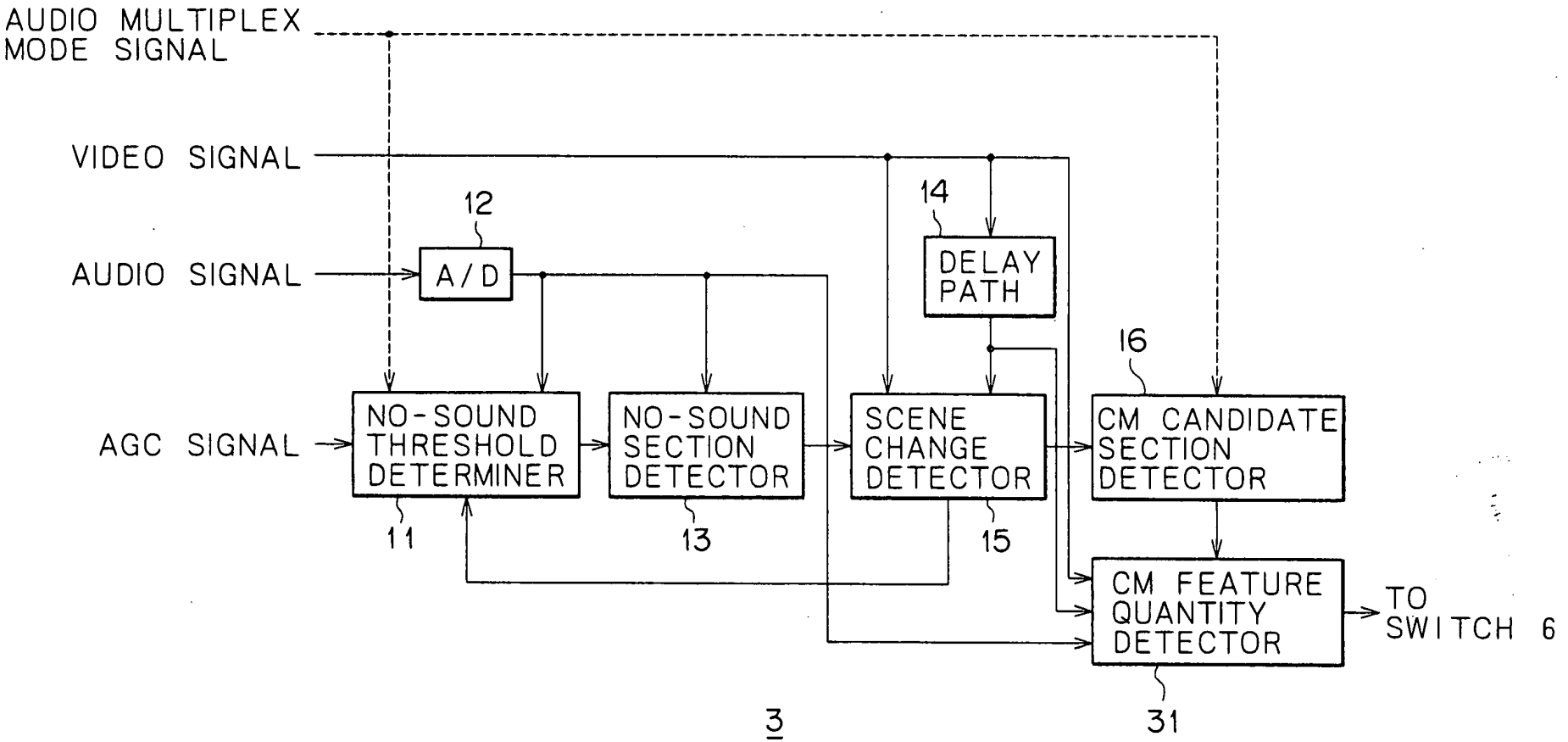

AUDIO MULTIPLEX MODE SIGNAL
VIDEO SIGNAL
AUDIO SIGNAL
AGC SIGNAL
12
A/D
14
DELAY PATH
16
NO-SOUND THRESHOLD DETERMINER
NO-SOUND SECTION DETECTOR
SCENE CHANGE DETECTOR
CM CANDIDATE SECTION DETECTOR
CM FEATURE QUANTITY DETECTOR
TO SWITCH 6
11
13
15
31

FIG. 20

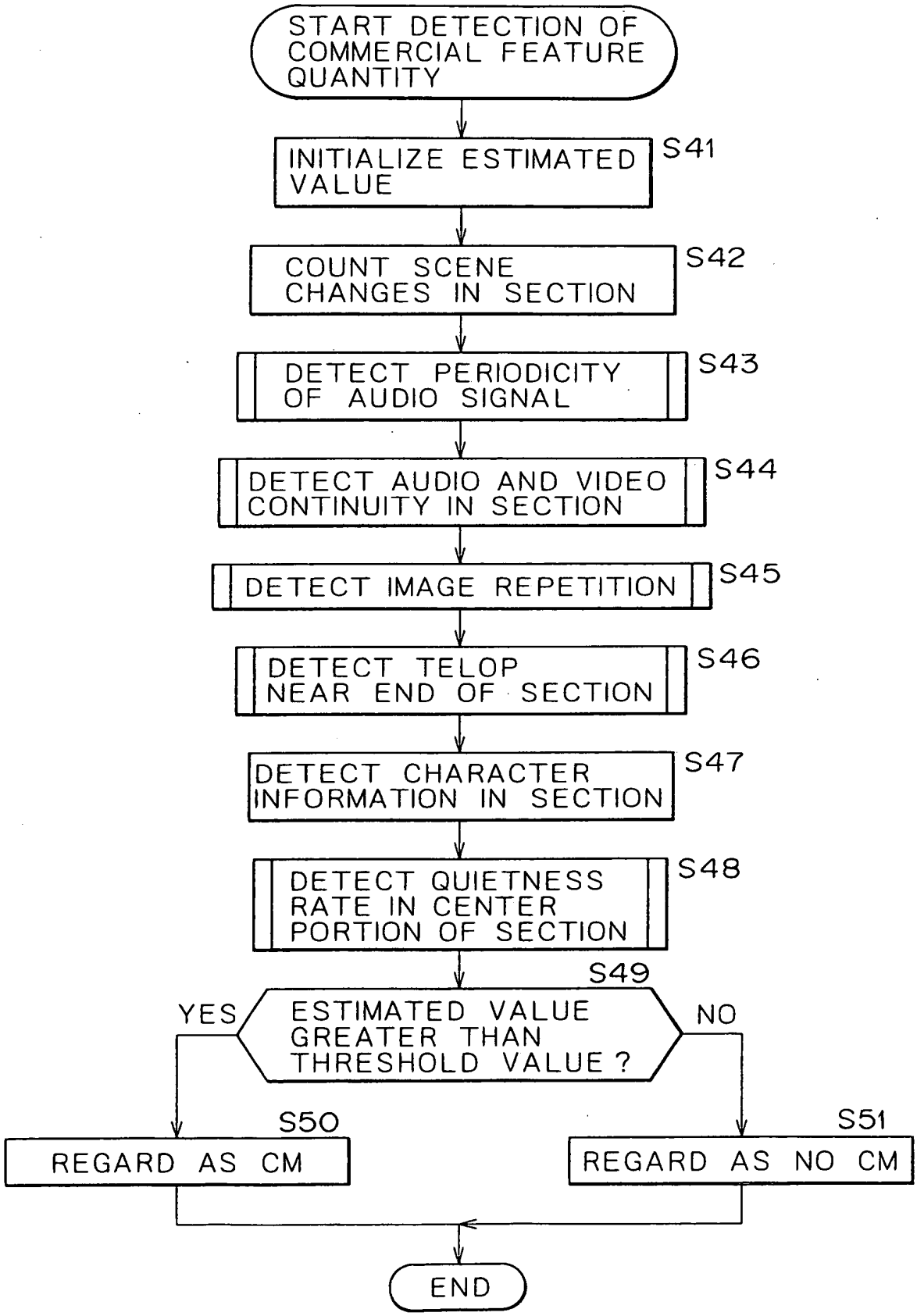

START DETECTION OF COMMERCIAL FEATURE QUANTITY
INITIALIZE ESTIMATED VALUE
S41
COUNT SCENE CHANGES IN SECTION
S42
DETECT PERIODICITY OF AUDIO SIGNAL
S43
DETECT AUDIO AND VIDEO CONTINUITY IN SECTION
S44
DETECT IMAGE REPETITION
S45
DETECT TELOP NEAR END OF SECTION
S46
DETECT CHARACTER INFORMATION IN SECTION
S47
DETECT QUIETNESS RATE IN CENTER PORTION OF SECTION
S48
S49
ESTIMATED VALUE GREATER THAN THRESHOLD VALUE ?
YES
NO
S50
REGARD AS CM
S51
REGARD AS NO CM
END

FIG.21

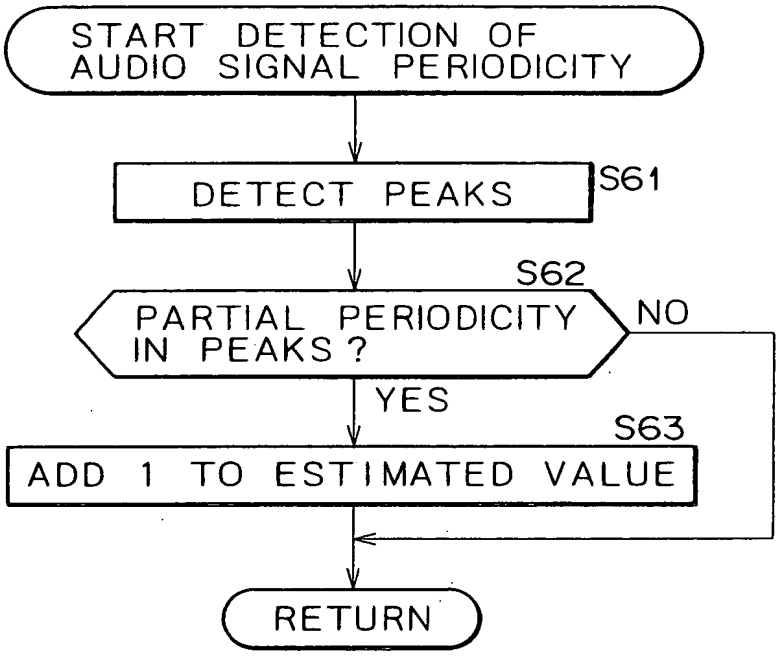

START DETECTION OF AUDIO SIGNAL PERIODICITY
DETECT PEAKS
S61
S62
PARTIAL PERIODICITY IN PEAKS ?
NO
YES
S63
ADD 1 TO ESTIMATED VALUE
RETURN

FIG. 22A

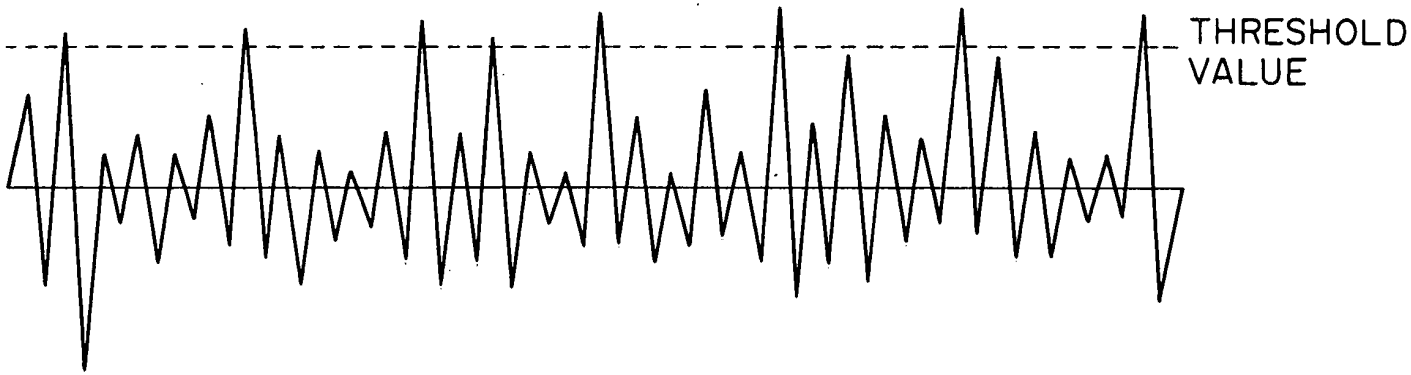


FIG. 22B

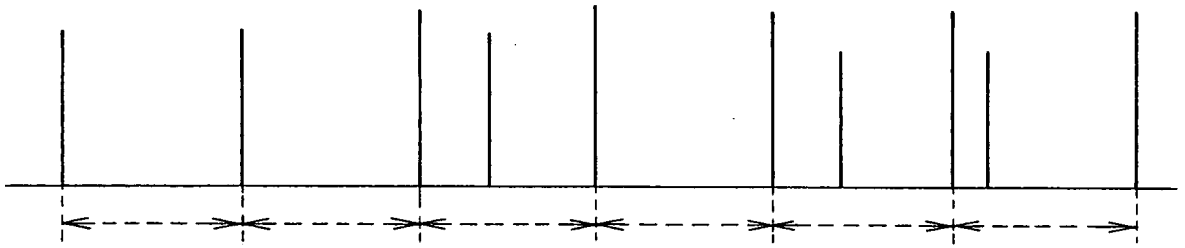


FIG. 23

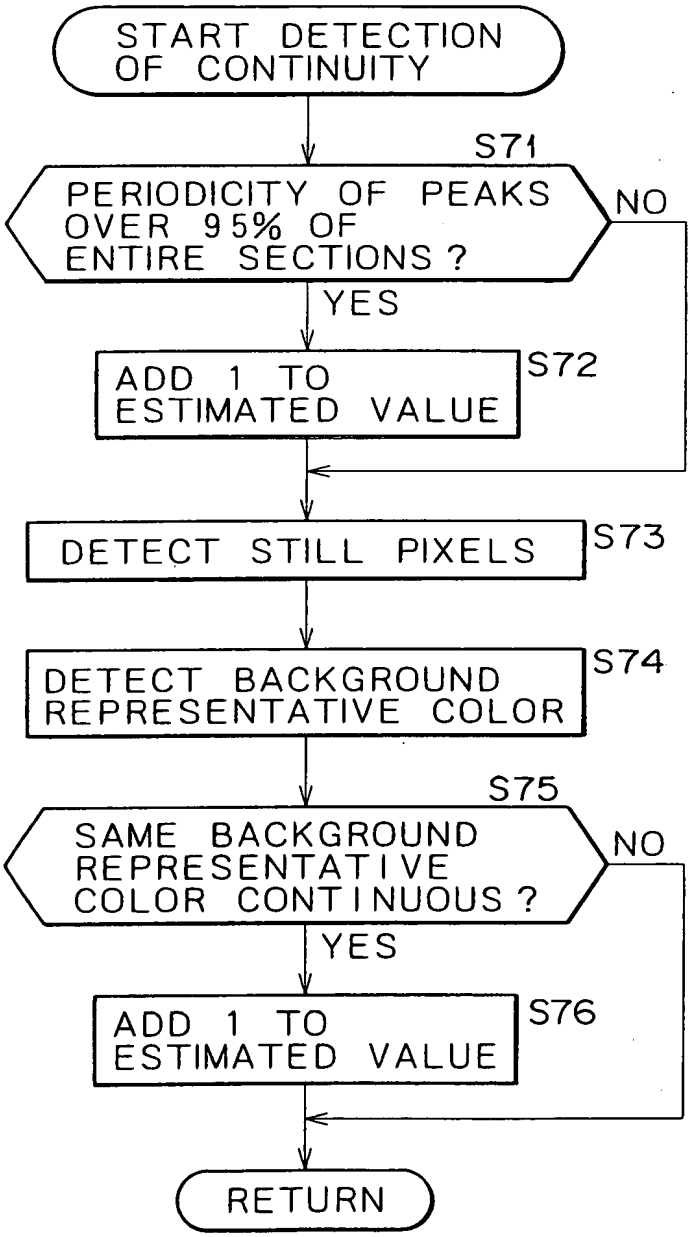

START DETECTION OF CONTINUITY
S71
PERIODICITY OF PEAKS OVER 95% OF ENTIRE SECTIONS ?
NO
YES
ADD 1 TO ESTIMATED VALUE
S72
DETECT STILL PIXELS
S73
DETECT BACKGROUND REPRESENTATIVE COLOR
S74
S75
SAME BACKGROUND REPRESENTATIVE COLOR CONTINUOUS ?
NO
YES
ADD 1 TO ESTIMATED VALUE
S76
RETURN

FIG.24

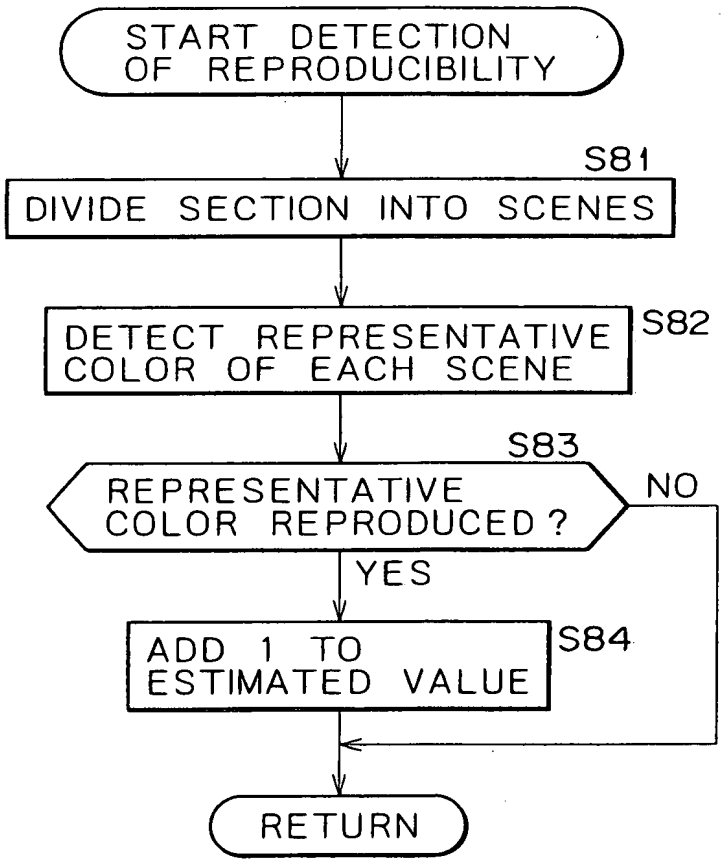

START DETECTION OF REPRODUCIBILITY
S81
DIVIDE SECTION INTO SCENES
DETECT REPRESENTATIVE COLOR OF EACH SCENE
S82
S83
REPRESENTATIVE COLOR REPRODUCED?
NO
YES
ADD 1 TO ESTIMATED VALUE
S84
RETURN

FIG.25

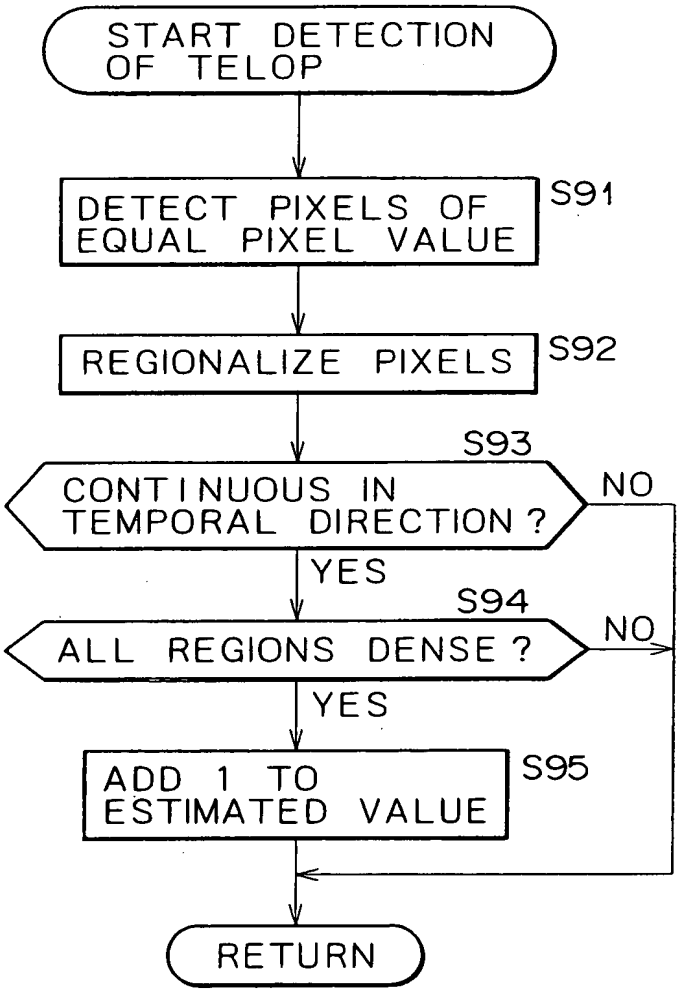

START DETECTION OF TELOP
DETECT PIXELS OF EQUAL PIXEL VALUE
S91
REGIONALIZE PIXELS
S92
S93
CONTINUOUS IN TEMPORAL DIRECTION ?
NO
YES
S94
ALL REGIONS DENSE ?
NO
YES
ADD 1 TO ESTIMATED VALUE
S95
RETURN

FIG. 26A

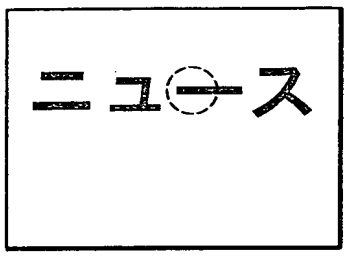


FIG. 26B

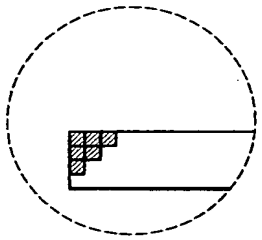


FIG. 26C

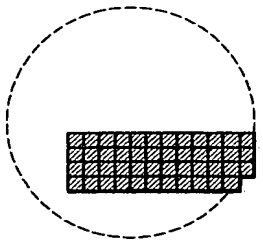


FIG.27

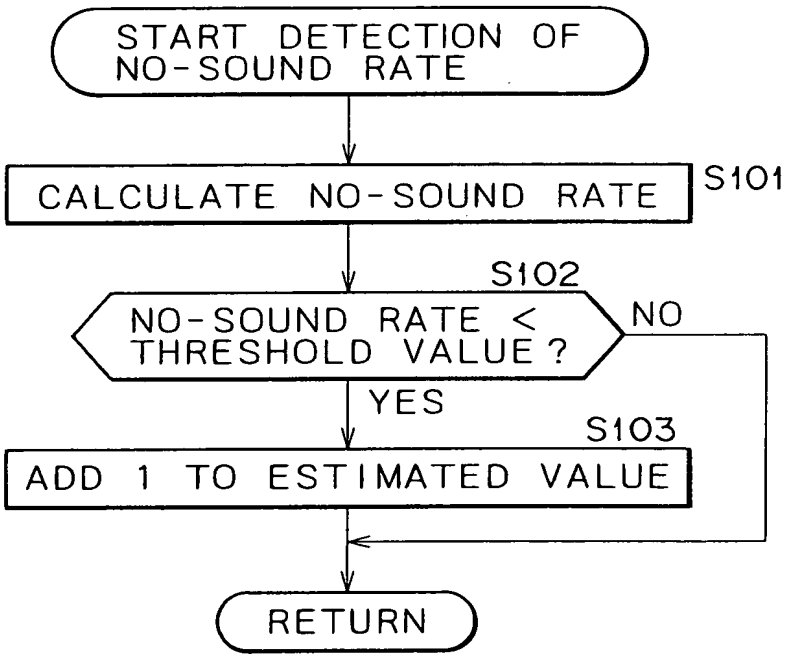

START DETECTION OF NO-SOUND RATE
CALCULATE NO-SOUND RATE
S101
S102
NO-SOUND RATE < THRESHOLD VALUE ?
NO
YES
S103
ADD 1 TO ESTIMATED VALUE
RETURN

FIG. 28

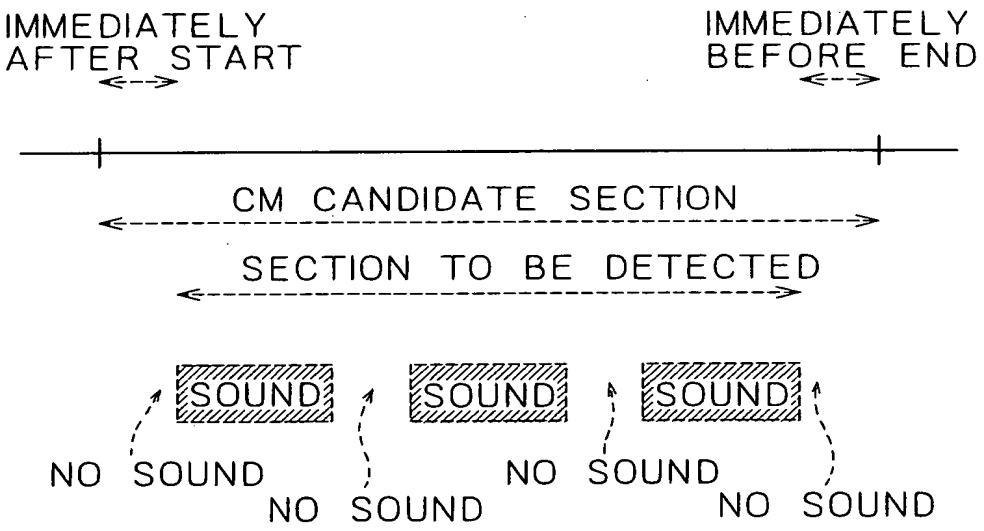
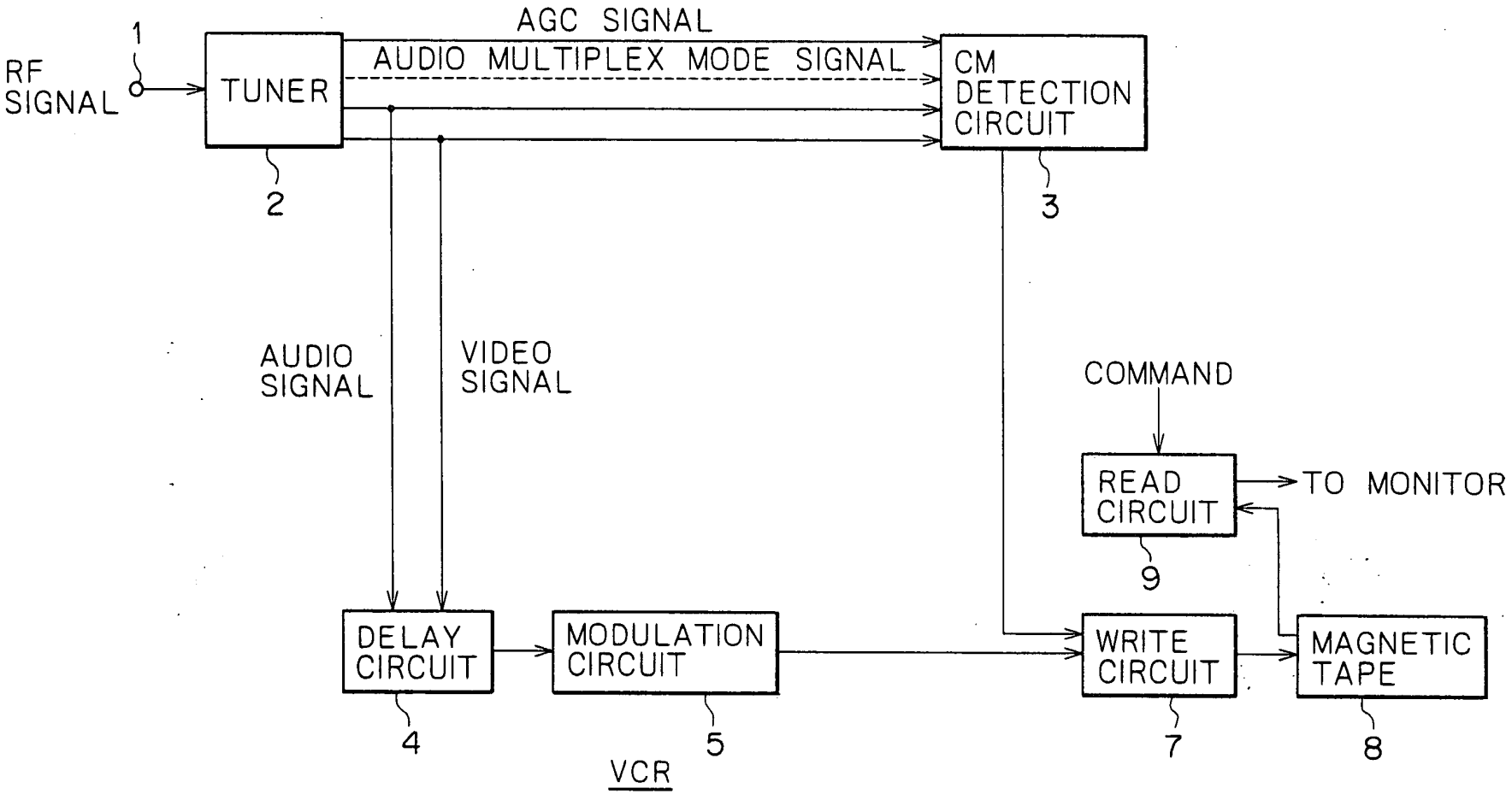

IMMEDIATELY AFTER START
IMMEDIATELY BEFORE END
CM CANDIDATE SECTION
SECTION TO BE DETECTED
SOUND
SOUND
SOUND
NO SOUND
NO SOUND
NO SOUND
NO SOUND

FIG. 29


1
RF SIGNAL
TUNER
2
AGC SIGNAL
AUDIO MULTIPLEX MODE SIGNAL
CM DETECTION CIRCUIT
3
AUDIO SIGNAL
VIDEO SIGNAL
COMMAND
READ CIRCUIT
9
TO MONITOR
DELAY CIRCUIT
4
MODULATION CIRCUIT
5
WRITE CIRCUIT
7
MAGNETIC TAPE
8
VCR